**Sample Space and Tree Diagrams**

Outcome = a possible result of an event

Ex: The outcomes of flipping a coin are heads and tails.

The outcomes of a flipping a coin twice and heads-heads, heads-tails, tails-heads

Event = the thing that we’re finding the probability of

*Ex*: The sample space for flipping a coin is {heads, tails}

The sample space for flipping a coin twice is {heads-heads, heads-tails, tails-heads, tails-tails]

Sample Space = the set of all possible outcome of an event

Using the sample space can help us to figure out the total possible outcomes for an event (or multiple events).

*Ex*: You have a green shirt, a yellow shirt, and an orange shirt. You have a pair of jeans and a pair of khaki pants. How many possible outfits do you have?

The sample space (possible outcomes for putting together an outfit) is:

{green shirt-jeans, green shirt – khakis, yellow shirt-jeans, yellow shirt – khakis, orange shirt-jeans, orange shirt-khakis)

There are 6 possible outcomes for choosing an outfit.

Sometimes it’s difficult to determine the sample space when there are many choices, so we use a tree diagram to show the sample space in a more organized way.

Tree Diagram = a diagram that shows all possible outcomes of an event (sample space)

To create a tree diagram, we start with one choice. From the example above, we can either start with shirts or pants. You can start with either event. We get the same sample space, regardless of which event we start with.

Here’s one way, starting with choosing a shirt first:

Each possible outcome gets it’s own “branch” on the tree diagram.

Orange Shirt

Green Shirt

Yellow shirt

Then, we move to the next choice – pants:

We draw 2 more branches (one for each outcome – jeans or khakis) from the ends of our existing branches.

Orange Shirt

Green Shirt

Yellow shirt

Khakis

Jeans

Khakis

Khakis

Jeans

Jeans

When we count the ends of our final set of branches, we get the number of outcomes in our sample space (6).

If we follow each branch from start to finish, we get the list of outcomes in our sample space.

Yellow Shirt – Jeans

Yellow Shirt – Khakis

Green Shirt – Jeans

Green Shirt – Khakis

Orange Shirt – Jeans

Orange Shirt -Khakis